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and Desertification

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AN OVERVIEW OF ENVIRONMENTAL MANAGEMENT IN AFRICA

DROUGHT AND DESERTIFICATION

Purpose of the Document

The main purpose of this document is to exchange ideas with Chinese Environmental specialists regarding:

(a) A review of the drought and desertification problems in Africa; and

(b) How the problems are being perceived and addressed.

Action Proposed

The meeting is expected to review this document which would be used as one of the main working papers of the Study Tour.

AN OVERVIEW OF ENVIRONMENTAL MANAGEMENT IN AFRICA

DROUGHT AND DESERTIFICATION

INTRODUCTION

1. The period 1968-1973 is now widely considered as the reference point of the world awakening to the seriousness of the problems of drought and desertification in Africa. During this period, the international community was aroused to the problems of drought and desertification by the severity of the five-year drought. The following Sahel countries were most affected: Burkina Faso, Chad, Mali, Mauritania, Niger and Senegal.

2. According to available information 1/, over 150,000 people and millions of cattle and other livestock perished in the subregion during this period.

3. The 1982-1985 drought affected about 34 African countries. Twenty sub-Saharan countries are still drought striken; nine of which are severely affected 2/. Six of the twenty most affected countries 3/ (Angola, Botswana, Mozambique, Lesotho, Zambia and Zimbabwe) are in the Southern region. In the Eastern region, Ethiopia, Kenya, Somalia and the United Republic of Tanzania; while in the Sudano-Sahelian region the remaining eight countries of the twenty most affected ones are: Burkina Faso, Cape Verde, Chad, Mali, Mauritania, Niger, Senegal and the Sudan.

4. It is estimated that of the 150 million people living in these drought-affected countries, 30 million may be seriously affected, and, of this number, as many as 10 million have became displaced persons because they have had to abandon their homes in search of food, water and pasture for their herds 4/.

5. Desertification in the African region has been "encroaching on useful agricultural land at the rate of 60,000-70,000 km2 per year. The creeping desert is choking agricultural land and affecting the livelihood of about 60 million people directly" 5/.

1/ Mostafa K. Tolba, "Can desertification be stopped?" Desertification Control Bulletin, Vol.7, no.2 (December 1978), pp. 7-8.

2/ Adebayo Adedeji, "The African Development Problematique: Demography, Drought and Desertification, Dependency, Desequilibrium, Debt and Destablization", or "the Paralysis of Multiple Debilitating Crisis", United Nations Economic Commission for Africa, pp. 6-7.

3/ Ibid.

4/ Ibid.

5/ Mostafa K. Tolba, "Can Desertification be stopped?" Desertification Control Bulletin, Vol.7, no.2, (December 1978).

II. UNDERSTANDING DROUGHT AND DESERTIFICATION (The Problem of Definition)

Drought

6. "Most human settlements throughout history have had to face major drought and desertification problems. Drought have occurred without famine, and famine without droughts, (Eg. Garcia, 1980; Sen, 1983; Watts, 1983). Some studies have compared the impacts of drought occurring in the same region but at different times, (Eg. Sircoulon, 1976; Bowen, et.al, 1980). Still others have shown that different socio-economic groups within the same region or area are affected by drought in different ways". 6/

7. According to Glantz and others, the most common view of drought today is "meteorological" 7/. This definition centers on a relative lack of rainfall during a given period of time. But many other criteria are used to determine when a drought occured. Glantz, et.al., cite recent example of this as being provided in North-East Brazil, where many believed that the region had recently had a five-year drought. But Brazilian meteorologists, however, noted that the rainfall record suggested that only two of the last five years could have been classified as drought. This seems to suggest that other criteria are also used to define drought.

8. Some scientists suggest that "agricultural drought" occurs when moisture stress occurs at critical points during the growth and development phases of crops and reduces productivity 8/. Others suggest that before a shortfall of precipitation becomes of concern to a community, it must adversely affect the established economy of the country or region. "Hydrologic drought" is another example. Hydrological drought is considered to occur when streamflow is below some percentage of the long-term mean. It is possible that different people using the same information about precipitation can disagree about whether or not drought has in fact really taken place.

9. While it is not important to have agreement on a universal definition, it is important that people agree on what others mean by the word "drought".

Desertification

10. Glantz, Katy and others observed that land use practices that are effective in humid regions are frequently not as effective in drier areas. 9/ The end result of a mismatch between land use practices and the long-term rainfall characteristics of an area is environmental degradation, a degradation that often leads to desertification. These authors argue that desertification can generally be viewed as a process of degradation of land resources (Eg. declining crop yields, decreasing density of vegetative cover, reduced soil fertility).

11. Scientists recently have developed hypotheses about how the reduction of vegetative cover in arid and semi-arid areas increases the albedo (reflectivity of solar radiation), which in turn weakens rain-atmospheric processes. 10/ Charney, et.al., (1977) described the interactions between the land and the atmosphere as follows:

6/ Glantz, Michael; Katy, Richard; Magalhaes Antonio and Ogallo, Leban Cultivating Agriculturally Marginal Lands: Drought follows the Plow - Unpublished document.

7/ Ibid.
8/ Ibid.
9/ Ibid.
10/ Ibid.

"... the radiative heat loss caused by high albedo of a desert contributes significantly to the sinking and drying of the air aloft, and therefore, to the reduction of precipitation. This dependence of precitipitation on albedo led (Charney) to propose a biogeophysical feed-back mechanism linking vegetation, albedo and precipitation as a partial explanation for recurrent drought in area bordering deserts. Of the soil is light dry and sandy, as it often is in these areas, decrease in vegetation will lead to an increase of albedo, a reduction of precipitation, and therefore, a further decrease in vegetation or, at least, a perpetuation of the initial decrease..."

12. Scientists feel that "drought and desertification can occur separately, without one necessarily causing the other. It is believed that an important factor in whether these are linked, is the condition of the land and its vegetative cover at the time of drought" 11/.

III. OVERVIEW OF DROUGHT AND DESERTIFICATION ACTIVITIES AT THE SUBREGIONAL AND REGIONAL LEVELS

A. Comité Inter-Etats pour la Lutte contre la Sécheresse dans le Sahel (CILSS)

13. The African governments in the Sahel region most affected by the drought of 1968-1973 established an intergovernmental organization known as "Comité inter-états pour la lutte contre la sécheresse dans le Sahel" (CILSS). The CILSS consists of the following member countries: Burkina Faso, Cape Verde, Chad, the Gambia, Mali, Mauritania, Niger and Senegal.

14. The main objectives of CILSS have been:

(i) Strengthening the subregional co-operation in rehabilitating the drought-stricken economy of its member countries;
(ii) Promotion of the overall development of its member States through programmes for food and animal production;
(iii) Reafforestation, road networks for marketing and drought relief;
(iv) Promotion of research and training for desertification control.

15. In order to meet the above objectives, the CILSS countries formed an association with OECD donor countries, known as the Club du Sahel, in 1976. At the beginning, the Club du Sahel's programmes and activities were concentrated on afforestation activities to halt deforestation and soil erosion. Presently, most of its work programme covers major sectors of development, such as water resources development, fisheries improvement, livestock and agricultural production, and research and training. CILSS has a technical secretariat based in Ouagadougou, Burkina Faso.

B. Inter-Governmental Authority on Drought and Development (IGADD)

16. The Inter-Governmental Authority on Drought and Development (IGADD) was created in January 1986 by the governments of six Eastern African countries. The following countries are members: Djibouti, Ethiopia, Kenya, Somalia, Sudan and Uganda.

11/ Ibid.

17. The need for such intergovernmental organization dealing with the problems of drought and desertification became clear as a result of the 1983-1986 drought.

18. The objectives of IGADD are:

(i) Development of programmes and activities on desertification control;
(ii) Management of water resources;
(iii) Agricultural research and related manpower development; and
(iv) Food security and early warning system.

19. To achieve these objectives, IGADD has established a small secretariat whose headquarters is located in the Republic of Djibouti.

C. African Centre of Meteorological Application for Development (ACMAD)

20. The African Centre of Meteorological Application for Development (ACMAD) was established as a result of the severe spells of drought during the 1982-1985 period.

21. In 1984, the United Nations Economic Commission for Africa (UNECA)'s Conference of Ministers of Economic Planning (which is the policy body of UNECA) passed resolution 518 (XIX) on the establishment of ACMAD. By this resolution, the Executive Secretary of ECA was requested to examine, in close collaboration with the World Meteorological Organization (WMO), the feasibility of establishing such a centre.

22. By ECA Conference of Ministers' resolution 621 (XXII) of April 1987, it was decided to locate ACMAD's headquarters in Niamey, Republic of Niger.

23. It is envisaged that ACMAD will collect meteorological data, process and analyse the data received, make systematic and periodically regular information to users for application to agricultural production, water resource management and other human activities that depend on weather and climate. In addition, the Centre will also carry out the following activities:

(i) Monitoring of weather over the continent and provide weather forecasting;
(ii) Classification of climate and definition of major weather systems over the tropical, semi-arid and arid lands of Africa;
(iii) Development of methods for the application of meteorological information for the improvement of agricultural production and weather related human activities as well as the development of new and renewable energy resources that depend on the weather and climate;
(iv) Training of African scientists through workshops, seminars and refresher courses, in techniques of meteorological application.

IV. DROUGHT AND DESERTIFICATION CONTROL ACTIVITIES OF THE UNITED NATIONS SYSTEM RELATING TO AFRICA

24. The United Nations General Assembly responded to the severe Sahelian drought of 1986-1973 by the establishment of the United Nations Sudano-Sahelian Office (UNSO) with its African regional office located in Ouagadougou, Burkina Faso. The office was established in 1973.

25. The main objectives and role of UNSO are:

(i) Co-ordination of development activities relating to the rehabilitation of drought-stricken countries in the Sahel subregion with a view to mitigating the effects of future droughts;
(ii) Assistance to achieve self-sufficiency in the Sahel region's staple foods and promotion of socio-economic development in the region.

26. UNSO's first mandate dealt with drought related medium- and long-term recovery and rehabilitation programmes in the eight member States of CILSS, namely, Burkina Faso, Cape Verde, Chad, the Gambia, Mali, Mauritania, Niger and Senegal.

27. Following the United Nations Conference on Desertification in 1977, UNSO was accorded a second mandate to assist the countries of the Sudano-Sahelian region, on behalf of the United Nations Environment Programme (UNEP), under a joint venture of the United Nations Development Programme (UNDP) and UNEP, in accordance with decision 6/118 of 24 May 1978 of the UNEP Governing Council and UNDP Governing Council decision 25/10 of June 1978. According to the second mandate 12/, UNSO became responsible for co-ordinating the implementation of the Plan of Action to Combat Desertification in 19 countries. These countries, which include the eight member countries of CILSS, are as follows: Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Djibouti, Ethiopia, the Gambia, Guinea, Guinea Bissau, Kenya, Mali, Mauritania, Niger, Nigeria, Senegal, Somalia, Sudan and Uganda.

28. To meet its mandates, UNSO assists member States in planning and formulating projects and programmes identified, approved and given the necessary priority by governments in the Sudano-Sahelian region. UNSO also manages a United Nations Trust Fund for Sudano-Sahelian activities which provides resources from voluntary contributions for implementation of national projects not funded under bilateral or multilateral agreements.

29. The United Nations Environment Programme (UNEP) has global responsible for combating desertification and its related environmental problems. In pursuance of General Assembly Resolution 3337 (XXXIX) of December 1974, UNEP organized the United Nations Conference on Desertification (UNCOD) in Nairobi, Kenya, in September 1977. UNCOD formulated a Plan of Action to Combat Desertification (PACD). The Plan contained 28 recommendations for action at the international, regional and national levels. The plan established the following institutional arrangements within the United Nations system to assist in combating desertification:

(i) A Desertification Unit at UNEP headquarters;
(ii) An Inter-Agency Working Group on Desertification (IAWGD) meeting, approximately quarterly, to report to the Administrative Committee on Co-ordination (ACC); and
(iii) A consultative Group on Desertification Control (DESCON) to mobilize funding from donor agencies for projects.

12/ In 1984, UNEP Governing Council decision GC.12/L.13 endorsed inclusion of Ghana and Togo to the list of countries under UNSO's mandate.

30. The framework for designing, planning and implementing programmes for combating desertification within the United Nations System is based on the "United Nations Plan of Action to Combat Desertification" with its 28 recommendations. Of the 28 recommendations, 22 are directed towards national and regional actions. This indicates that ultimate responsibility for desertification control must rest with the member States in the affected areas.

31. The United Nations Economic Commission for Africa (UNECA), in its resolution 446 (XVII) of April 1982, regarding combating desertification in Africa, urged member States affected by desertification to establish a regional intergovernmental committee to combat desertification in Africa.

32. To implement resolution 446 (XVII), ECA formulated a bilaterally funded inter-agency co-operation project. This project was implemented in two phases with funding from the United Nations System and the United States Agency for International Development/Environmental Training and Management Programme in Africa, the Swedish International Development Authority (SIDA).

33. The first phase of this activities included a fact finding technical survey mission to assess the state of desertification and drought in the Kalahari desert areas. The second phase was the holding of a workshop on drought and desertification in the Sudan, 23-28 October 1982.

34. The problems of drought and desertification are given high priority in the work programme of the UNECA. Drought and desertification activities are reflected within the Environment Section of ECA. As a result of the high priority which the Commission attaches to desertification and drought, a regional adviser on drought and desertification is now assigned to the Environment Section to provide advisory services to member States.

V. ENVIRONMENT AND THE ECONOMIC CRISIS IN AFRICA

35. In response to Africa's persistent economic problems, the drought and famine of 1984-1985, the Organization of African Unity (OAU) adopted, in 1985, Africa's Priority Programme for Economic Recovery (APPER) 1986-1990, and the United Nations launched, in 1986, a Programme of Action for African Economic Recovery and Development (UN-PAAERD), 1986-1990. These programmes recognized that Africa's problems cannot be solved without commitments from both the African countries and the international community. In the short run, policies must be designed to deal with food shortages that might lead to outbreaks of famine and to detect at an early stage when and where such outbreaks may occur. In the medium-term, there must be greater agricultural investment, both arable and grazing lands must be made more productive, and prices and subsidies must send signals that are congruent with the goals of increasing agricultural yields and productivity. Crisis management must not lead to neglect of Africa's medium- and long-term constraints on development, among which, are its limited environmental resources. To permit growth in the longer run, these constraints will have to be eased.

36. Both APPER and UN-PAAERD emphasize environmental management and conservation as an important part of the economic recovery process.

37. The term "environment" is open to many definitions. A broad definition encompasses the natural and the controlled environments and extends to the social conditions facing current and future generations and living organisms in general.

38. The following have been identified as Africa's main environmental problems:

(i) Desertification - a process of biomass productivity decline with consequent loss of crop, livestock and fuelwood productivity;
(ii) Deforestation - a process of reduced forest and woodland cover, with consequent loss of fuelwood supplies and soil protection;
(iii) Groundwater loss and contamination - arising from demands for water in excess of natural recharge rates and salinization; and
(iv) Urban and water pollution - caused by inadequate treatment of sewerage and industrial discharges.

39. Desertification is manifested in soil erosion, soil compaction, a reduction in the soil's organic matter and nutrient content, and salinization and water-logging. Soil erosion refers to the transportation of top-soil by winds and rains. When soil is compacted, the ability of the soil to retain moisture is impaired. Reductions in organic matter and nutrient content lessen soil fertility. Salinization and water-logging are caused by the use of low quality water and poor drainage. All of these forms of desertification result in reduced crop and/or livestock yields.

40. Estimates of the extent of desertification by type of land use and region are given in Table 1. In irrigated lands, desertification is manifested, primarily, by salinization and water-logging (although compaction is also a problem where heavy machinery is used). These problems are most severe in the Nile Valley and North Africa, but occur in most irrigated areas. In rangelands, desertification is evidenced by a reduction in the vegetative cover, and sometimes also by erosion, crusting and loss in fertility. In areas of rainfed cropland, the major factor is soil erosion, although loss in fertility, crusting and compaction are also important. In terms of the areas affected, desertification is more extensive in the rangelands than in areas of rainfed cropland or irrigated land. On the basis of land area, the problem in irrigated areas seems to be relatively minor. However, the per-hectare economic impacts of desertification are more severe for irrigated lands simply because both physical output and the unit-value of crops are higher on irrigated land. The economic cost per hectare of salinized irrigated land is estimated to be three times as great as the cost of desertified rainfed cropland and 100 times as great as the cost of desertified rangeland. 13/

41. Desertification is most acute in Sudano-Sahelian Africa (See Table 2). Within this region, some areas are more seriously affected. If one considers the

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13/ H.E. Dregne, "Combating Desertification: Evaluation of Progress", Environmental Conservation, Vol. 11, no.2, Summer 1984, p. 115.

Table 1: Desertification in Africa

Type of Land	Northern Africa	Sudano-Sahelian Africa 1/	Southern Africa 2/
	(Thousands of Hectares)		
Irrigated Land			
Total	4,050	2,126	720
Affected by desertification	987	284	49
Percent of total	24.4	13.4	6.8
Rangeland			
Total	166,300	814,412	156,500
Affected by desertification	156,000	783,458	49,300
Percent of total	93.8	96.2	31.5
Rainfed Cropland			
Total	17,005	27,103	2,940
Affected by desertification	13,701	23,057	2,225
Percent of total	80.6	85.1	75.7

Source: Y.F. Ahmad and M. Kassas, Desertification: Financial Support for the Biosphere, (London: Hodder and Stoughton, 1987), Table 1, pp. 63-66.

Notes: 1/ Includes: Cape Verde, Chad, Djibouti, Ethiopia, Gambia, Kenya, Mali, Mauritania, Niger, Nigeria, Senegal, Somalia, Sudan, Uganda, Cameroon, Burkina Faso.
2/ Excludes South Africa.

Table 2: Actual and Sustainable Human Populations in Sahelian and Sudanian West Africa

Zone	Crop/Livestock Sustainable Population	Actual Rural Population	Difference
	(Millions)		
Saharan/Sahelo-Saharan	1.0	1.8	-0.8
Sahelian	3.9	3.9	0.0
Sahelo-Sudanian	8.7	11.1	-2.4
Sudanian	8.9	6.6	2.3
Sudano-Guinean	13.8	3.6	10.2
Total	36.3	27.0	9.3

Source: J.E. Gorse and D.R. Steeds, Desertification in the Sahelian and Sudanian Zones of West Africa, World Bank Technical Paper no.61, 1987, Table 4, p. 28.

difference between actual human populations and carrying capacity 14/ (the number of people an area of given size can support on a sustainable basis), areas of particular sensitivity can be identified. A recent World Bank study 15/ has found that using this measure, desertification poses its greatest threat in a horizontal zone running through Senegal, southern Mauritania, southwestern Mali, northern Burkina Faso, southern Niger, northern Nigeria, northern Cameroon and Chad. This zone, identified as the Sahelo-Sudanian zone in Table 2, lies south of the Saharan and Sahelo-Saharan zones. The problem of desertification is seen as being more than merely stopping an "advancing desert", which is an oversimplified and misleading view of desertification.

42. The Sahelo-Sudanian zone is bordered to the south by an area where the actual rural population is less than the population which the environment is capable of sustaining. This relative imbalance has led populations in the worst affected areas to migrate south. At current population levels, the south seems capable of absorbing these migrants. But if productivity gains do not keep pace with population growth, the little margin that exists now will be quickly taken up.

43. Desertification is often accompanied by a reduction in tree cover. In arid and semi-arid areas, this is especially due to demands for fuelwood. Indeed, the World Bank study referred to above found that the fuelwood carrying capacity of Sahelian and Sudanian Africa is exceeded by the actual (rural plus urban) population in every zone except the southern most Sudano-Guinean zone 16/.

44. Based on estimates of fuel requirements and availability, a study by the FAO has identified the population at risk throughout sub-Saharan Africa, where fuelwood is in especially short supply 17/. Populations experiencing "acute scarcity" are defined in the study as those living in areas where energy requirements could not be met even by taking wood on a non-sustainable basis or by making use of animal waste. Populations experiencing a fuelwood "deficit" are those living in areas where fuel needs were met by taking wood on a non-sustainable basis. Using these criteria, the study found that the most vulnerable areas include, not only the arid and semi-arid zones south of the Sahara, but also the eastern and south-eastern parts of the continent, and the islands and mountainous regions of Africa.

14/ Most measures are based on nutritional and fuelwood subsistence needs, and estimates of available sustainable yields. Thus, if there are x tonnes of sustainable fuelwood supply per annum, and the subsistence need is y tonnes per person, the fuelwood carrying capacity is x/y. Care must be exercised in interpreting estimates of carrying capacity. See D.J. Mahar (ed.), Rapid Population Growth and Human Carrying Capacity: Two Perspectives, World Bank staff working paper no.690, 1985.

15/ J.E. Gorse and D.R. Steeds, Desertification in the Sahelian and Sudanian Zones of West Africa, World Bank Technical paper no.61, 1987.

16/ Op.cit., specially Tables 3 and 4 on pages 13 and 28.

17/ M.R. de Montalembert and J. Clement, Fuelwood Supplies in the Developing Countries, FAO Forestry Paper no.42, (Rome: FAO, 1983).

Deficits are also experienced in the savannas of West, Central and East Africa. The number of people affected by fuelwood shortages, already large, is expected to increase steadily under the pressure of population growth (see Table 3).

Table 3: Populations Experiencing either an "Acute Scarcity" or a "Deficit" in Fuelwood Supply in Sub-saharan Africa

	1980	2000 1/
	(Millions)	
Rural affected population	180	464
Total rural population	288	473
Affected population (as percent of total)	62%	98%
Total affected population	201	535
Total population	320	549
Affected population (as percent of total)	63%	97%

Source: M.F. de Montalembert and J. Clement, Fuelwood Supplies in the Developing Countries, FAO Forestry Paper no.42, Rome, FAO, 1983.

Note: 1/ The projections are based on expected rates of population growth.

45. Soil erosion rates are notoriously difficult to calculate and all sources caution against relying too heavily on numerical estimates. Table 4 reproduces illustrative data for parts of Africa. Soil erosion has both on-farm impacts in terms of reduced crop productivity and off-farm impacts in terms of sedimentation, but detailed research into the quantification of these impacts is surprisingly limited.

46. In tropical Africa, forests are cleared for agriculture and felled for fuelwood and commercial timber - sawn logs, veneer logs and wood for pulp. Data on tropical forest resources and rates of production and clearing are imperfect, as the data on most of Africa's environmental resources, but a study by the FAO and UNEP hints at the scale of the problem. 18/ Of tropical Africa's undisturbed and productive closed broadleaved forests. 19/ 225 thousand hectares each year are cleared, mainly for agriculture, and 635 thousand hectares each year are selectively logged for hardwoods and veneers (see Table 5). If these rates for 1981-85 persist, the undisturbed forests of tropical Africa will all have been altered in some way in about 130 years' time.

18/ J.P. Lanly, Tropical Forest Resources, FAO Forestry Paper no.30, Rome, FAO, 1982.

19/ As defined by the FAO and UNEP, these are forests more than 60 to 80 years of age which have been undisturbed by logging and are accessible to exploitation.

Table 4: Examples of Erosion Rates in Africa

Location	Details	Mean Annual Rainfall (mm)	Erosion Rate (ton ha/year)
Ethiopia, Central plateau	Suspended sediment yields	500-800	165
Tanzania, Mpwapwa	Bare plot	620	146
Cote d'Ivoire Adiopodoume	Bare soil, 7% slope	2,100	138
Zimbabwe, Henderson	Bare soil, 7% slope	750	127
Burkina Faso, Gampela	Bare soil, 7% slope	800	126
Zimbabwe	Bare plot, 4% slope	400	10.8
Zimbabwe, Henderson	Complete grass cover, 4.5% slope	750	0.7
Cote d'Ivoire Adiopodoume	Natural bush fallow	2,100	0.6
Zimbabwe, Umsweswe	Sediment yield for catchment	750	0.25
	Severely eroded sub-catchment	750	9.8

Source: M.A. Stocking, Rates of Erosion and Sediment Yield in the African Environment, IAHS Publication no.144, 1984, p.288, Table 3

Table 5: Undisturbed Productive Closed Forests in Tropical Africa

	Broadleaved	Coniferous
	(Thousands of hectares)	
Resource 1/	113,889	245
Rate of clearing 2/	225	1
Rate of logging 2/	635	4

Source: J.P. Lanly, Tropical Forest Resources, FAO, Forestry Paper no.30, Rome: FAO, 1982, Table 3, p. 62, Tables 6a and 6b, pp. 78-79, and Tables 7a and 7b, pp. 91-92.

Notes: 1/ As of the end of 1985;
2/ 1981-85 annual average.

47. If we consider disturbed (logged) forests, managed forests and open tree formations as well, then clearing alone (mainly for agriculture) has proceeded at a rate of 3.7 million hectares per year (see table 6). If this rate continues unabated, all of tropical Africa's closed and open productive forests will be cleared in under nine decades. This calculation assumes that forest areas are not replanted. However, it is estimated that only one out of every 29 hectares cleared is replanted. 20/

Table 6: Areas of Tree Formation and Rate of Clearing in Tropical Africa

	Closed	Open
	(Thousands of hectares)	
Resource 1/	156,734	159,555
Rate of Clearing 2/	1,331	2,345

Source: J.P. Lanly, Tropical Forest Resources, FAO Forestry Paper no.30, (Rome, FAO, 1982), Tables 7d and 7e, p. 93, and the table on p.97.

Notes: 1/ As of the end of 1985;
2/ 1981-85 annual average.

48. These aggregate figures mask important differences among regions and countries. 21/ Of West Africa's 2,126 thousand hectares of undisturbed,pproductive closed forests, 164 thousand hectares, or almost eight per cent, are logged annually. In East Africa, only 1.6 per cent of the forests are logged annually; in Central Africa, the figure is only 0.4 per cent. The undisturbed closed forests of East Africa are cleared at a rate of 1.7 per cent per year, while in West Africa, the rate is about one per cent and in Central Africa, it is 0.1 per cent.

49. In tropical areas, forests have for centuries been cleared for shifting cultivation and secondary forest has been established on fallow land. But as populations have grown, pressures on the land have increased and fallow periods have become shorter so that secondary forest succession often does not occur. When fallow periods shrink, there is a loss in soil fertility and in the soil's ability to resist erosion. Yields can be maintained or increased, but only with the help of chemical fertilizers. This problem has particularly profound implications for agricultural yields in West Africa, where shifting agriculture is widely practised (see Table 7).

50. Fertilizer use is, however, extremely low in Africa, and as a result yields have fallen. One alternative to the application of chemical fertilizers is agroforestry. Planting of leguminous trees can enrich the soil by fixing nitrogen and at the same time produce fuelwood in as little time as three years. 22/ This

20/ J.P. Lanly, op.cit.

21/ FAO and UNEP, Forest Resources of Tropical Africa, Part I: Regional Synthesis, (Rome: FAO, 1981), Table 3, p. 57, Table 7a, p. 95 and Table 6a, p.86.

22/ Forestry Department, Changes in Shifting Cultivation in Africa, Forestry Paper no.50, (Rome: FAO, 1984), p. 25.

Table 7: Fallow Areas in Tropical Africa

	Total Area (Thousands of Hectares)	Total Fallows	Percent of Total (percent)
Northern Savana	4,236,322	12,750	3.0
West Africa	2,015,817	55,642	27.6
Central Africa	5,325,681	44,615	8.4
East Africa	8,496,392	52,644	6.2
Tropical Southern Africa	1,399,285	330	-
Tropical Africa	21,473,497	165,981	7.7

Source: Forestry Department, Changes in Shifting Cultivation in Africa, Forestry Paper no.50, Rome: FAO, 1984.

is just one example of the ecological interlinkages that exist in Africa. Trees not only serve as a supply of logs, fuelwood, poles and fodder but they also control soil erosion by nutrient recycling, water retention and providing wind shelter. The cutting of trees can hasten the spread of desertification.

51. The greater part of deforestation in Africa is due to agricultural clearance. Perhaps two-thirds of the clearance is for shifting agriculture with less and less prospect for re-establishment of secondary forest as the pressure for expanded agricultural land grows. Explaining agricultural clearance is far more complex than putting the blame at the door of many millions of small farmers. Underlying the demand for extension land is rapid population growth, price and policy incentives to marginalize subsistence crops in favour of allocating more productive land to cash crops, subsidies, climatic change and the breakdown of common property management regimes. In short, explaining agricultural colonisation is a complex procedure combining many elements of social and economic pressures on agriculturalists. 23/ In turn, this means that policy to correct or at least contain deforestation has to focus on discouraging small farmers from clearing the land indiscriminately and on removing the factors which facilitate major invasions of forest such as large-scale mechanised agriculture. 24/

52. Highly variable rainfall in many parts of Africa makes water conservation vital. Irrigation costs are high - US$5,000 to US$25,000 per hectare - and many large irrigation schemes face problems of contaminated water through over-application of fertiliser and pesticides and the concentration of waterborne diseases such as schistosomiasis. This suggests a refocussing of efforts to develop other water resources based on shallow groundwater and, of critical importance, on local control and involvement. Even here, there are problems:

23/ See, for example, D. Southgate and D.W. Pearce, "Natural Resource Degradation in Developing Countries: A Causal Analysis of Agricultural Colonisation" Discussion Paper 87-26, Department of Economics, University College London, July 1987.

24/ Eg. mechanized agriculture is responsible for major vegetation clearance in Sudan, and mechanised agriculture is heavily subsidized. See D.W. Pearce, Natural Resource Management in West Sudan, Government of Sudan, Khartoum, and World Bank (Washington, DC, July 1987).

new boreholes frequently act as a "magnet", drawing in nomadic and semi-sedentary livestock owners who subsequently deplete the wells or degrade the vegetation around them. Integrated water-livestock-forestry management is required in place of investment and policy efforts which frequently stress one objective at the cost of overall efficiency.

VI. CONCLUSIONS

53. Drought and desertification are serious problems in Africa. Since the mid 1960s, the major environmental problems of drought and desertification have been addressed by national Governments affected and by the United Nations system. From 1982-1985, drought affected about 34 African countries. Up to today's date, the issues of drought and desertification are still a major problem on the continent.

54. Even though it is considered a major problem in Africa, the existing programmes to combat drought and desertification are of 'emergency nature'. There is a strong need to develop programmes and activities that are geared toward long-term measures.

55. National governments need to re-orient their higher education programmes towards training manpower in the field of desertification control techniques. Without the trained manpower, the problems of drought and desertification will not be adequately addressed.

56. Therefore, this Study Tour and Training Workshop in China is a small step in the right direction.